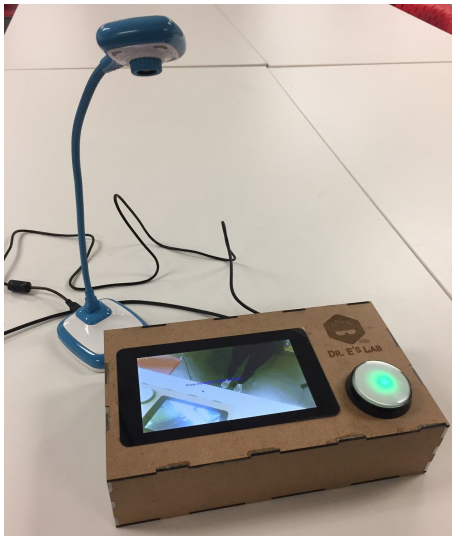
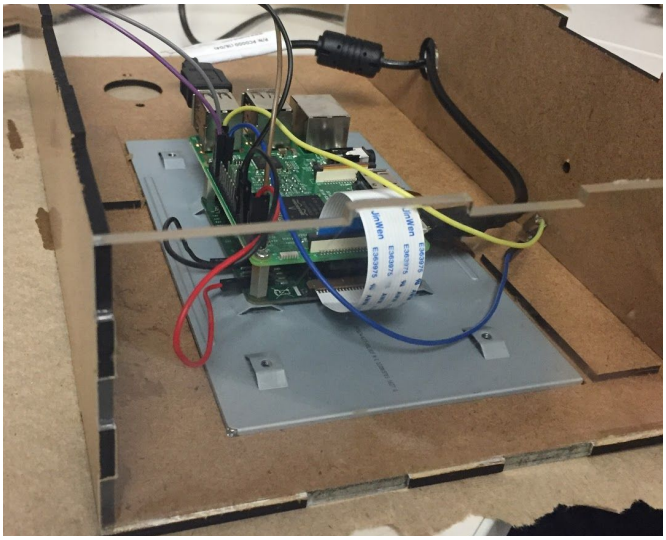
# Documentation Station 2.0 Setup Guide

Hello there!
We really hope you can learn from our struggles. Included in this setup guide are solutions to many of the problems we grappled with. For full effectiveness, in this doc, click Tools>Document Outline so you can navigate easily. If you have any questions, don't hesitate to reach out to us (Ashwin/David/Fiona/Ryan).. Ethan and Susan know how to reach us :)

*Teachers should only have to do steps [D], [E], and [G]*



## Documentation Station 2.0 Specifications

Documentation Station 2.0 was released January 2017. Some improvements from past versions include:

- To run the documentation station program, it is an executable file on the desktop
- Executable program (in python) to set time and date
    - Runs at the beginning of program to make sure pictures are saved with correct date/time tag
- If no USB drive is plugged into documentation station, will save pictures to local drive
- Executable program (in python) to copy files from local drive to USB
    - Saves the pictures in a folder called Local_to_USB (/media/pi/USBDRV/Local_to_USB)
    - If the USB drive is not connected and user tries to execute this program, the user is notified with a pop up window

- When the USB drive is being used in the documentation station for the first time, it will create a folder called Doc_Station_Photos for the pictures (/media/pi/USBDRV/Doc_Station_Photos)
- As long as the USB drive is named USBDRV and formatted to VFAT or FAT32, any USB drive can be used with our documentation station without additional formatting
- Display of 7" raspberry pi rotated 180 degrees so power cable comes out the back and USB plugs are on the right hand side (so the documentation station is (unintentionally) designed for right handed people)
- This setup guide! As thorough as possible, with diagrams to make setup process easier
- The take picture button glows (using LED lights)

# Materials needed

*The letter(s) in brackets **[X]** corresponds with the steps under 'Setting up for the first time'*

- Access to the Setup Files (Google Doc folder) **[A, F]**
- MicroSD card **[A]**
- A way for the computer to read the microSD card **[A]**
- Computer - MAC or PC **[A, B]**
- USB drive **[B]**
- Two buttons - one big and one small **[C]**
- Four M to F jumper wires (to be soldered on to the buttons) **[C]**
- All tools for soldering **[C]**
- A raspberry pi with 7" LCD screen **[D]**
- Screwdriver **[D]**
- Micro USB to USB cable **[E]**
- USB Hub with power adapter **[E]**
- Webcam **[E]**
- Laser cutter **[F]**
- ⅛" wood **[F]**
- Keyboard for debugging **[optional]**

# Setting up for the first time

### [A1] Load program to SD card (MAC)

Step 1. Download docstation2.0.dmg.zip from the Setup Files folder

Step 2. Unzip the folder

Step 3. Insert the SD card into your computer

Step 4. In terminal, type diskutil list
Find your SD card by looking for a disk of the right size and name. In the example below, the SD card is /dev/disk2.

```
/dev/disk2 (internal, physical):
   #:                       TYPE NAME                    SIZE       IDENTIFIER
   0:     FDisk_partition_scheme                        *15.5 GB    disk2
   1:             Windows_FAT_16 RECOVERY                1.2 GB     disk2s1
   2:                      Linux                         33.6 MB    disk2s5
   3:             Windows_FAT_32 boot                    66.1 MB    disk2s6
   4:                      Linux                         6.7 GB     disk2s7
```

Step 5. In terminal, using the name of your SD card
(and where your version of docstation2.0.dmg is saved),
enter sudo dd if=~/Downloads/docstation2.0.dmg of=/dev/disk2

Step 6. Wait until the command prompt reappears in the terminal window,
indicating the copying is complete. This step will take a while.

Step 7. After it's finished, eject the SD card

## [A2] Load program to SD card (PC)

Ask google (or Susan) :)

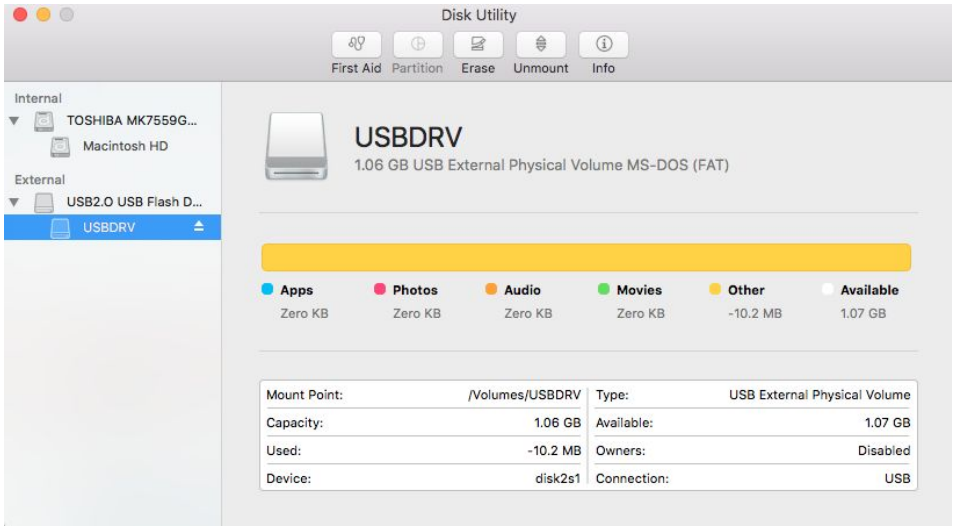
## [B1] Format the USB drive (MAC)

Step 1. Plug an EMPTY USB drive into your personal computer
This process will erase everything from your USB drive, so make sure it's truly empty

Step 2. Check the current format of your USB drive
1. Go to Finder
2. Right click on your USB drive
3. Click get info
If format is MS-DOS(FAT 32), you are all set! Skip Steps 3-7
If format is something else, continue with the steps below.

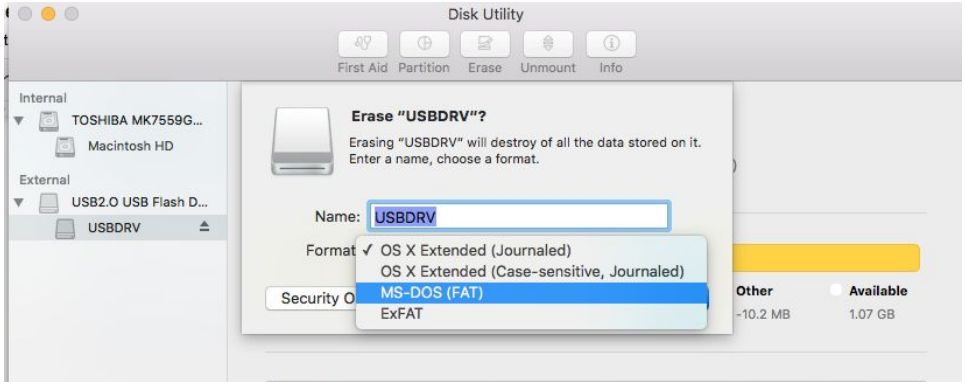
Step 3. Open the disc utility application


After it opens, you should see something like this

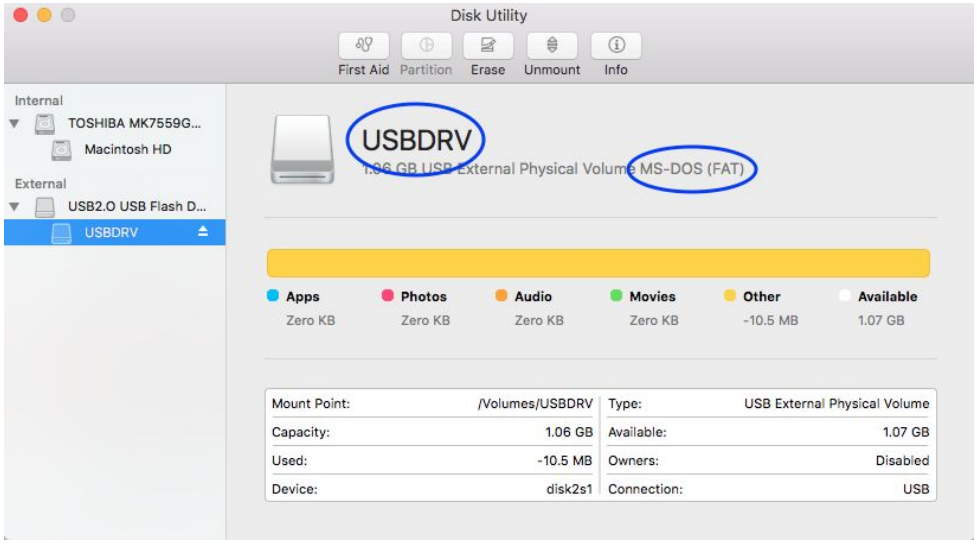



Step 4. Click Erase


Step 5. Name (in all capitals!): USBDRV
Format: MS-DOS(FAT)
(as shown below)
Click erase.




Step 6. Your USB drive should now be named USBDRV in the format MS-DOS(FAT)



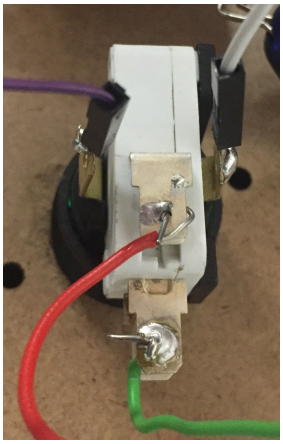

Step 7. Eject your USB drive.
Your USB drive is now ready for use with the raspberry pi!

## [B2] Format the USB drive (PC)

Follow the link: http://www.wikihow.com/Format-a-Flash-Drive
In the process, choose
File system: Fat32
Volume label: USBDRV

## [C] Solder the buttons

Solder two of the male to female jumper cables to the small reset button. Solder four of the male to female jumper cables to the big picture taking button (as shown in the picture below. Color of the cable doesn't matter). Ask Dr.E/Google for instructions on soldering.

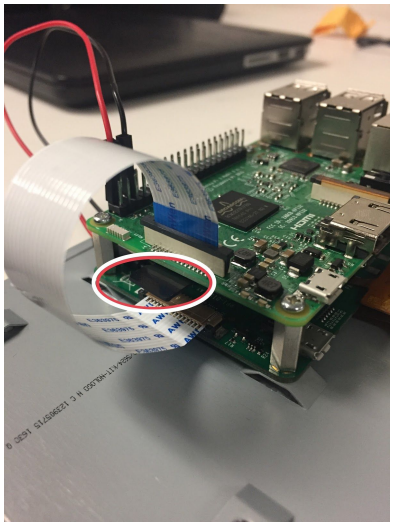


## [D] Setup raspberry pi and LCD screen

Watch this video to set up the 7” Raspberry Pi screen until (3:25)
https://www.youtube.com/watch?v=tK-w-wDvRTg

## [E] Connect everything

Step 1. Insert SD card into the raspberry pi

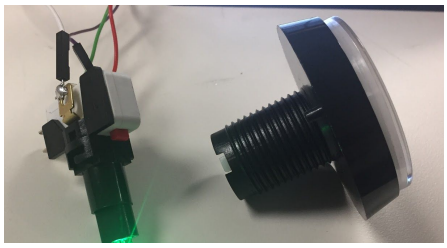


Step 2. Plug in formatted USB drive into the USB port on the raspberry pi

Step 3. Attach the micro USB to USB cable to the USB hub with power adapter.
Plug the power adapter into the wall.
Wait until the raspberry pi finishes powering on!
If your raspberry pi is not powering on, check out ‘not starting up’ in the troubleshooting section of this guide.

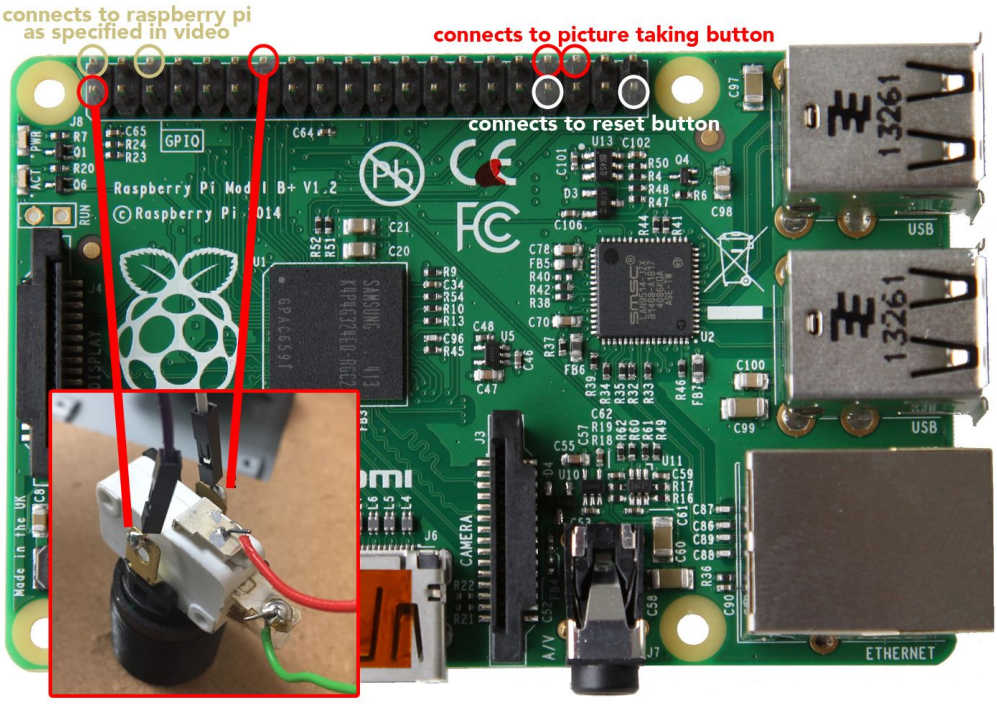
Step 4. After it’s finished, plug webcam into a USB port on the raspberry pi

Step 5. Attach the bottom part of the big picture taking button to the top part (picture below)



Step 6. Now, plug the buttons into the raspberry pi as follows:

1. Plug in the two cables indicated in the inset picture (below)
   After these cables are plugged in correctly, the big picture taking button should light up
2. Plug in the remaining two cables attached to the big picture taking button (in red on the diagram below)
3. Plug in the two cables attached to the small reset button (in white on the diagram below)




Step 6. Double click “run_program.py” on the desktop and click “execute”
If it doesn’t work, unplug and replug the webcam.

Step 7. TAKE A PICTURE!!
Right now, the picture will save locally. If you want to save directly to USB or save files from local to USB, see instructions under ‘Using the documentation station’

## [F] Laser cut the box

Step 1. Download woodSides.ai from the Setup Files folder

Step 2. Open the file in adobe illustrator (this is the file for front, back, top, and bottom)

Step 3. Laser cut the box using ⅛” wood
Job type: combined
Raster setting: Speed 50
Power 100

Vector setting: Speed 20
Power 60
Frequency 500

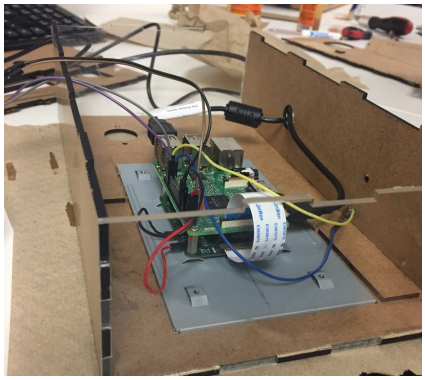
Step 4. Download clearSides.ai from the Setup Files folder

Step 5. Open the file in adobe illustrator (this is the file for the two sides)

Step 6. Laser cut the box using ⅛” clear material
Vector setting: Speed 25
Power 100
Frequency 5000

### [G] Secure all parts

-There are 4 wooden boards and 2 plastic boards
-The bottom board has a rectangle cut in it which is used as a door to access the internal electronics
-Take the bottom board and screw two hinges to hold the door
-Place the two buttons in their respective places
-Connect the matching pieces of the boards with glue in between the teeth



# Using the documentation station

### Run the program

If you close the program properly (using the small reset button), the program should start on its own (but it takes a bit of time). However, if the program does not automatically start, double click “run_program.py” on the desktop and click “execute”

### Take pictures

Use the big button to take pictures, and the small reset to properly close the program.

If the program crashes, unplug and replug the webcam. If that doesn't solve the problem, see 'Program crashing' under 'Troubleshooting'

### Save directly to USB

If you want the pictures to save directly to a USB drive:

1. Close the program using the small reset button
2. Plug in a properly formatted USB drive
   (to format the USB drive, see [B1] or [B2] under 'Setting up for the first time')
3. Run the program

If the USB drive is not properly formatted or not inserted correctly, the pictures will save to the local drive.

### Save from local to USB

To save from the local drive to your USB, plug in a properly formatted USB drive (to format the USB drive, see [B1] or [B2] under 'Setting up for the first time'), then double click "copy_local_to_usb" on the desktop and click "execute". A pop up window will let you know if the files have successfully copied.

## Troubleshooting

### General tips

- Command terminal is your friend! HOWEVER, note that SUDO means Super-User DO (aka making you the most powerful person ever), so be careful when entering SUDO commands.
- If executing a program by double clicking doesn't work, run the program in the command terminal (sudo python /home/pi/location of file you're trying to run.py) to see what the errors are.
- Sometimes, you are restricted by read/write access. Either use SUDO and make yourself the most powerful person ever, or check out permissions (in command line, use cd to get to directory you want to check permissions of, then ls -l) and adjust accordingly
  - 777 = everyone has access to read/write/execute
  - 755 = everyone can read/execute, and only the owner can write

### Can't type # or "

If the keyboard settings are to UK, to type #, type \ and to type ", type @.
However, if you want to change it in your settings, follow these steps (source)

1. In the command terminal, type sudo raspi-config
2. Choose internationalization menu

3. Choose keyboard setup menu
4. Pick one generic 101 keyboard
5. Scroll down and select [Other]
6. Then, select [English(US)]
7. Then, scroll to the top of the list to select [English(US)]
8. Complete the other menus as prompted until you are back to the main menu
9. Reboot the raspberry pi

### Make a file shortcut on the desktop

Drag and drop file to desktop.
Note: Sometimes, when you edit the file, the text in the shortcut does not change, so you need to recreate the shortcut… but not all the time.

### Manually change the date and time of the raspberry pi

In the command terminal, type sudo date -s "Mon Jan 1 24:12:00 UTC 2000"
(there are other formats to type the date and time, but we found this one to be easiest)

### Mount your USB drive

**This should no longer be necessary. We only needed to follow these steps when initially setting up the SD card.**

1. Plug your USB drive into the raspberry pi
2. Find the UUID of your new USB drive
   Type sudo blkid into the command terminal
   Find the line that says /dev/sda. The line should have "LABEL="USBDRV"". Your UUID is after "UUID=".
3. Type sudo nano /etc/fstab into the command terminal
4. At the top of the file, add the follow line (all in one line)
   UUID="your_uuid" /home/pi/usbdrv vfat
   uid=pi,gid=pi,umask=0022,**nofail,noatime**,sync,auto,nosuid,rw,**user** 0 0
   ***Bolded** are parts different from what is listed in Susan's thesis
5. Save and exit
   - Press control and X at the same time
   - Type Y
   - Press enter

### Not starting up

We struggled with this for a long time when first getting started. Sometimes, if your power source isn't good enough, the raspberry pi will not start up. What worked for us was what is described in this setup guide (micro USB > USB > USB hub > wall outlet). However, this

method did not work with every USB hub we tried... so if your pi isn't starting up, don't give up! Try another USB hub.

### Rotate the screen

Go to the file /boot/config.txt. At the top of the file, add the line lcd_rotate=2 in order to flip the screen 180 degrees. This will flip the display on the 7" raspberry pi screen, but will remain the right way around when connected to a monitor with an HDMI cable.

### Program crashing

The majority of the time, unplugging and replugging the webcam solves the problem. If that doesn't work, find out what the error is. Since you are running the executable you don't see the error and the program just stops. To figure out the error, you have two options:

- Go to command line, type sudo python /home/pi/run_program.py. When you run the program through command line, it will tell you the error. If it has to do with webcam.start(), it's a webcam problem... otherwise, check out our other troubleshooting solutions.

## Improvements for Documentation Station 2.1 → ∞

*Credit for these ideas goes to Ashwin, Dr. E, Fiona and Susan!*

**Smaller Things**

- Desktop background is designed to make it clear which button should be clicked to run the program. However, when the raspberry pi is attached to the bigger monitor, nothing is aligned.
- Right now, in some of our code, we use 'os.system' to run a command line command within our python code. It would also be good to check out using 'subprocess' instead (maybe more reliable?)
- When plugging in a USB, sometimes USB is in /home/pi and sometimes /media/pi (not sure if this is still the case..?) If it is no longer the case, take out the if statement we wrote in the docstation_2.0.py code.
- If there is an error with the program (ex. Webcam not plugged in correctly), use the error received to write a pop up message to tell the user what went wrong
- When executing (applies to all of the executables), fix so the program executes directly without the pop up window that says open/execute/etc.
- UI of set date/time pop up needs work :)

**Bigger Things**

- Use battery powered clock to set pi time and date
- Format USB to VFAT or FAT32 using a script
- Save local files to cloud
- Slideshow feature (and integration with the main script)

- Dual camera (one camera ‘top-down’ for model and whiteboard and another camera ‘selfie-mode’ for pictures of student(s) with model)
- Tagging images (use touch screen to ‘tag’ pictures with steps of engineering design process)
- Rethink delete interface (right now, you have to wait five seconds before taking another picture… consider a way for student to ‘bypass’ the five seconds)
- Give teachers ‘delete images from local drive’ option (as an executable on desktop?)
- A teacher ‘configuration’ mode triggered by touch (in corner) or by small restart button